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ABSTRACT

Several recent experiences suggest that Hungarian students are among the best prepared mathematically in international comparisons of achievement. This paper outlines the cultural background of mathematics learning in Hungary that influences that international standing. Achievement factors in the whole cultural context include: the role of traditions in the development of the Hungarian system, the mathematics curriculum, school work standards, the role of extracurricular activities in selecting gifted students, social and socio-political factors, and the system of dealing with gifted students. (MDH)

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MATH ACHIEVEMENT IN CULTURAL CONTEXT: THE CASE OF HUNGARY

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Abstract

If the artistic and scientific achievements of Hungary are somewhat known outside the borders of the country, it probably is due to her great musicians and mathematicians. Several recent experiences suggest that Hungarian students are among the best prepared in international comparisons. Not only do the top students score at the in international competitions (e.g. math Olympic), but representative surveys (e.g. IEA studies) indicate high achievements of Hungarian students as well. Keeping the standards high over long periods of time is not only a question of curriculum or teaching methods; history, traditions, values also play significant roles. In this presentation several factors of the whole cultural context will be analyzed: the role of traditions, the place of math education in schooling will be discussed and the system of dealing with the gifted students will be outlined.

Introduction

In 1990 a cross-cultural study was carried out to examine the social, school and family factors that determine math learning and facilitate students' achievement. The study was coordinated by a research group at the University of Michigan. It is a continuation of a longitudinal project carried out in the United States, Japan and Taiwan by Harold Stevenson, Shin-ying Lee and their colleagues (1990). Connie Flanagan was responsible for bringing Hungary into the most recent phase of the project. The participants were 5th and 11th graders, their mothers and teachers. The data analysis has just started and some preliminary results will be presented at this conference. The aim of the present paper is to

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outline the cultural background of mathematics learning in Hungary in a broad sense.

Indicators of achievement

The general notion about the math achievement of Hungarians is that it is reasonably high. There is a lot of truth in this view and several facts support it. First *the contribution of Hungarian mathematicians to the development of many modern fields of mathematical science* is well known, as is the contribution of those who become famous for their math-related achievements outside the circles of the experts. Second, *Hungarian students traditionally rank at the first place in international student math competitions*, e.g. Mathematics Olympic. More reliable and systematic information was provided by *international comparative educational surveys*, that documented, that Hungarian students did well in mathematics and science. (The best known and widely accepted examinations have been carried out by the IEA. Concerning the results of the last one see Robitaille and Garden, 1990.)

However, at this point I would refine somewhat the picture. This information consistently documents, that when students in the highest performance group are compared, Hungarian students compare very favorably in international comparison. Thus, Hungary might have much more top mathematicians, would be expected from its size and the level of economic development. The few math champion students are among the world's best. Students in the academic high schools (gymnasium) also rank well among similar high schools in other countries. Representative samples of the student population do somewhat less well, and if we consider the least educated vocational school students, they are hardly above the average.

Thus, it is impossible to describe the complicated picture of mathematics achievement in Hungary with a single study or with a focus on only a few groups of the student population. Instead I would say that the knowledge of mathematics is very unevenly distributed. From the point of view of the general tendencies of the evolution this might be a very adaptive strategy for a small country with a limited amount of resources. In the next part of this paper I list some agencies that are responsible for generating the present state.

Factors of achievement

School system

The development of the Hungarian educational system - as well as most of those in Central Europe - was influenced by the school systems of the German speaking countries. From the point of view of our topic, this influence has three important features.

(1) *The Herbartian theory combined with the Prussian practice formed the Hungarian schools firm, autocratic, selective institutions.*

(2) *Large emphasis on formal training.* Studying structures of the grammar of ancient Greece and Latin, later mathematics was considered as the best tool to exercise the mind.

(3) *Elitian structure of the school-system.* Providing very high level of instruction for a selected few instead of emphasizing the importance of mass education.

As a consequence of this influence, the educational system developed in a way such that the whole vertical system leading up to the universities appeared very soon. Serving the needs of the upper levels become almost the only function of the lower levels. The present system of education (Figure 1) still carries the traces of this development.

The "matura", the final examination at the academic high-schools (gymnasiums) was also imported from Prussia. The subjects of this very prestigious examination changed over time, but mathematics has never been dropped out. It has always been an integral part of the examination.

Curriculum

Although Hungarian schools have a centralized, uniform national curriculum, gifted children are taught in many different ways. (Table 1). There is one major difference between the Hungarian math curriculum and the curricula of the countries that do not have a central curriculum. That is, that the majority of the students are learning the same, "normal" curriculum, and the other variations are exceptions, offered for the gifted children. Since the reform of 1977, even the regular curriculum offers possibilities for those who are able and motivated to learn more than the compulsory material.

For the elementary schools, the core teaching material is compulsory, while teachers can present the 20-30% additional material for those students who are interested in learning more. (For an international comparative analysis see Travers and Westbury, 1989.) Less than 1% of the students is learning more than the normal curriculum. There are some schools, mostly in the large cities, which organize classes with an enriched mathematics program, teaching it more hours per week than the regular classes. Beyond that, there are a few special math classes in the country, where the most talented kids are learning. They are selected into these classes according to their previous results on math competitions or by strict entrance examination.

The variety is larger in the secondary schools. Mathematics, as well as the other academic subjects are not emphasized at the vocational school at all. There are large differences among the secondary modern schools, depending on their specialization. For example, at high schools with business, engineering or electronics orientation, more mathematics is taught than at the schools of music or visual arts.

At the gymnasium, where the main aim is to prepare the students for higher educational studies, academic training is the highest. The four years are divided into three main parts: (1) compensation (1st year, those coming with poor knowledge from the elementary schools can catch up), (2) orientation (2nd year, try several fields of activity) and (3) specialization (3rd and 4th years, facultative classes in the field of interest). Thus, already the regular gymnasiums offer many extra possibilities of studying mathematics for the motivated third and fourth

graders. In the large cities there are math classes, where the students are selected by entrance tests and there are some regional math schools (classes), where the level of math teaching is extremely high. These classes are available only for the most gifted students on the basis of their former achievement. These classes accommodate not more than 100 students out of a c.a. 150,000 cohort.

School work, standards

There are very few studies that provide exact data about the norms, standards and atmosphere of Hungarian schools compared to other countries (e.g. Anderson, Ryan and Shapiro 1989). However, the research results support the generally shared opinion (mostly originated from researchers who had visited in other countries, or from parents who educated their children for a while in other countries, and recently from foreign students, who are learning in Hungarian schools), that Hungarian schools are relatively firmer. There is a larger emphasis on the academic subjects, especially on math and sciences. Students are more disciplined at schools. Time is used more efficiently. If the students don't reach the required minimum competency, they fail and they have to repeat the whole year. Thus, it could not happen that kids just proceed automatically, without having the required knowledge.

Extra curricular activities

The extra-curricular activities play an important role in selecting, motivating and training the most talented students. There are a wide-range of math competitions at each level of the educational system, and while a large number of students participate, at least at the school level, it helps to keep the standards of the regular teaching high as well. There are very frequent school-level and regional competitions, and the annual national competitions are the most prestigious (Table 2). The monthly publication "High-School Math Papers" has a problem section for which students send in solutions. This provides a continuous competition over the year. Many famous mathematicians mention these competitions as a basic impetus for their career (Hersh and John-Steiner 1988).

Social factors

The special nature of the mathematical knowledge might help to keep the standard high in a society where the school-system is selective and there is a low level of social mobility. While mathematics does not require a wide range of knowledge (e.g. information, factual knowledge, wide vocabulary, language competence) that mostly can be acquired through social learning, mathematics offer a great chance for talented students with a low socio-economic status. The "first generation vigor" provides them a very strong motivation and helps them to establish an academic existence. In the past few decades, at the Hungarian universities faculties of science and schools of mathematics have had a larger proportion of low SES students than faculties of liberal arts or language departments.

Socio-political factors

There are some political factors that at least during the last decades might contribute to preserving the traditions of Hungarian mathematics.

It is often mentioned by the mathematicians, that in a country with limited natural and economic resources, mathematics is the best (or only) discipline of research for the talented students, that does not require expensive equipment and materials. That fact really might have oriented a large number of students toward mathematical research.

Another political factor is that mathematics is a science which is more removed from politics. Thus, in a totalitarian system, mathematicians are those, who can most easily escape ideological pressure or influence. Achievements in mathematical research are more objectively assessed than in other fields. Ability and hard work could not have been replaced by political activity. While mathematics is hardly language dependent, it is one of the most international sciences. Mathematicians could easier communicate with their foreign colleagues and they could preserve their world-wide respect. These tendencies provided them a relatively large freedom and independence, and made mathematics an even more attractive field of research.

Traditions

> "Certain types of tradition of great importance are local, and cannot easily be transplanted. These traditions are precious things, and it is very difficult to restore them once they are lost."
>
> Karl Popper: Towards a rational theory of tradition

As Popper (1972) points out, sometimes it is hard to find an ultimate explanation for certain social facts. In our case, it is not easy to explain, while certain societies consider academic excellence important, while others don't. To spare the detailed historical analysis at this point, I would say, that it is a tradition in Hungary.

It goes back for centuries, that several institutions supported the learning of promising students (regardless of their social class). During the last five centuries, hundreds of talented Hungarian students had been visiting the famous European universities and returned back home with the knowledge they mastered. After the first world war, when Hungary lost two thirds of her historical territories, and manpower and talent of her people turned out to be almost the only one of her resources, the concept of academic excellence became one of the central elements of cultural policy.

Historians trace back the world-wide acknowledged contribution of Hungarian mathematicians through the second half of the last century. These traditions seemingly survived dramatic historical events, world wars and changes of political systems.

Despite the low social status of intellectuals during the last decades, the traditions of valuing academic excellence are still observable in certain sub-groups or sub-cultures of the Hungarian society, which probably contributes to keeping the achievement standards high. Recent empirical research into the correlates of mathematics achievement might show how vital these traditions are and how widely academic excellence is considered as a basic value.

References

Anderson, L.W., Ryan, D.W. and Shapiro, B.J. (Eds.) 1989. The IEA Classroom Environment Study
Pergamon Press, Oxford, New York, etc.

Hersh, R. and John-Steiner, V. 1988. A Visit to Hungarian Mathematics
Manuscript

Popper, K. 1972. Towards a Rational Theory of Tradition
In: Popper, K. Conjectures and Refutations. The Growth of Scientific Knowledge. Fourth edition
Routledge and Kegan Paul, London

Robitaille, D.V. and Garden, R.A. (Eds.) 1989. The IEA Study of Mathematics II: Contexts and Outcomes of School Mathematics
Pergamon Press, Oxford, New York, etc.

Stevenson, H.W. and Shin-ying, L. 1990. Contexts of Achievement
Monographs of the Society for Research in Child Development. Vol. 55. Nos. 1-2, Chicago

Travers, K.J. and Westbury, I. (Eds.) 1989. The IEA Study of Mathematics I: International Analysis of Mathematics Curricula
Pergamon Press, Oxford, New York, etc.

THE HUNGARIAN EDUCATIONAL SYSTEM

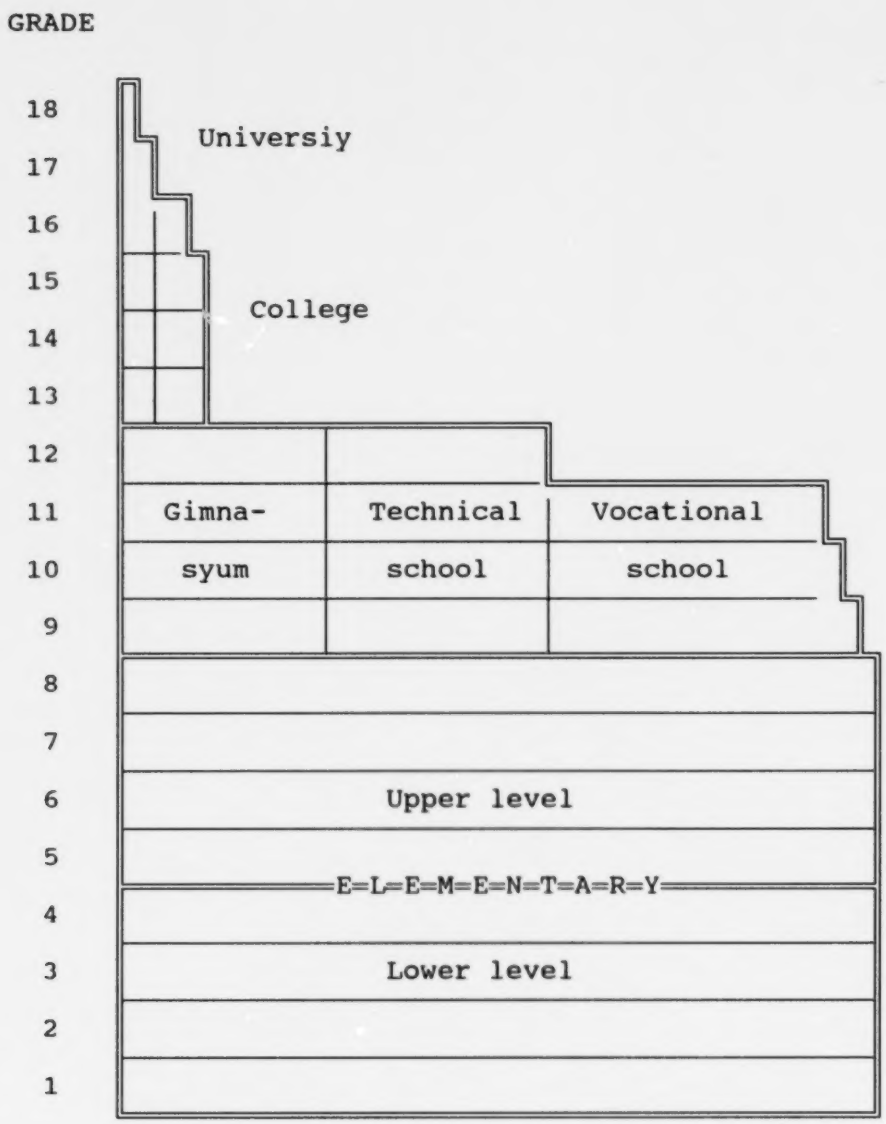

Figure 1

Table 1 Variations of mathematics curriculum

Elementary schools:
National mathematics curriculum
core
additional
Enriched math curriculum (5 through 8 grades)
Regional math schools (classes, e.g. Budapest, Szeged)
High schools:
National mathematics curriculum
core
additional
Facultative mathematics
(math track for the 3rd and 4th graders)
Enriched math curriculum
(math track for the 1st through 4th grades)
Regional math schools (classes, e.g. Budapest, Szeged, Veszprém)

Table 2 Institutions facilitating the gifted students' math learning

For elementary students:
Computer Programming Championships
School, local, county, regional, national competitions
Young Mathematicians Friendship Circles
(Part of the Society for the Popularization of Science)
National Competition for seventh and eighth graders
For high-school students:
Computer Programming Championships
School, local, county, regional competitions
High-school Mathematical Afternoons
(Organized by János Bólyai Mathematical Society)
Youth Mathematical Circles
(Organized by János Bólyai Mathematical Society)
Dániel Arany Competition (for first and second graders)
National Secondary-school Academic Competitions (for third and fourth graders)
Kürschák József Competition (for fourth graders and graduates)
Középiskolai Matematikai Lapok (High-School Math Papers 1893-)
Young Scientist's Competitions (televised, not regular)